Dr. Samuel P. Hayes, professor of psychology, will be in England until next fall.

Mr. C. Shearer, of Clare College, Cambridge, has been nominated to a newly established lectureship in experimental morphology at Cambridge.

DISCUSSION AND CORRESPONDENCE

THE WORD GENOTYPE

Professor Jennings (Science, December 15, p. 847) refers to the fact that the word genotype has two meanings, but does not make it quite clear that both are current at the present time. The use of the word, with a definition, by Schuchert antedates that of Johannsen, as has been several times pointed out. Taxonomists can hardly be expected to abandon their prior and useful term, so it becomes a question whether it is convenient to continue the Johannsenian usage, trusting to the context to indicate in every case what is intended.

Some months ago, in conversation, my colleague, Dr. George Norlin, suggested "amictotype" as a possible substitute for genotype in the sense of Jennings.

T. D. A. Cockerell

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GENOTYPE AND "GENOTYPE"

"In calling attention to the frequent misuse of the word 'genotype'" (quotation from George H. Shull in Science, February 2, 1912, p. 182), the students of heredity will please take notice that this term has been in biology since 1897 and that Shull, Johannsen and others persistently misuse the term. The original definition is as follows:

"*Genotype* (*genos* = race, and *typos* = type).—Genotype applies to any *typical material of the type species of a genus.* The material, however, should be, if possible, from the original locality of the species, or a genotype should also be a topotype or a metatype. Therefore there may be as many genotypes of *Lingula* as there are museums having characteristic specimens of *Lingula anatina.*"[1]

Charles Schuchert

[1] Science, April 23, 1897, p. 639.

SCIENTIFIC BOOKS

Lectures on Fundamental Concepts of Algebra and Geometry. By John Wesley Young, Professor of Mathematics in the University of Kansas. Prepared for publication with the cooperation of William Wells Denton, Assistant in Mathematics in the University of Illinois. With a Note on the Growth of Algebraic Symbolism by Ulysses Grant Mitchell, Assistant Professor of Mathematics in the University of Kansas. New York, The Macmillan Company. 1911. Pp. vi + 247.

Descriptive Geometry: A Treatise from a Mathematical Standpoint. By Victor T. Wilson, M.E., Professor of Drawing and Design in the Michigan Agricultural College. New York, John Wiley & Sons. 1909. Pp. viii + 237.

Elements of Descriptive Geometry with Applications to Spherical and Isometric Projections, Shades and Shadows, and Perspective. By Albert E. Church, LL.D., late Professor of Mathematics in the United States Military Academy, and George M. Bartlett, M.A., Instructor in Descriptive Geometry and Mechanism, University of Michigan. New York, American Book Company. 1911. Pp. 286.

Professor Young's "Lectures" presuppose in the reader intellectual acumen and a certain logical bent but little mathematical knowledge beyond the elements of algebra and geometry. Dealing with such topics as Euclid's Elements, A Non-Euclidean World, Consistency, Independence and Categoricalness of a Set of Assumptions, with the notions of class, correspondence and group, the assumptions of Hilbert and Pieri, dimensionality and hyperspace, variable, function and limit, and dealing with them in a way that is at once philosophic, romantic, scientific and well-nigh literary, the lectures ought to appeal to a wide and diversified class of readers, philosophers, logicians, both expert and inexpert mathematicians, and thinkers in general. The book is far more than its title indicates, for the concepts treated are presented as being fundamental to mathematics in general, to

mathematics regarded as "the universum of exact thought," rather than to algebra and geometry conceived as special branches thereof. Basic concepts and central concepts, though the two categories may intersect, are in general not the same, else the book would doubtless have admitted to a prominent place the notion of invariance, a notion that, besides being of central importance in mathematics, serves to ally the interests of this science with those of science in general, and with those of philosophy, theology, religion and art. It is the chief unifier of the great forms of human interests and endeavor. Professor Young has admirably shown that any science must contain two sorts of ideas, the assumed and the defined; besides these it uses ideas that it does not contain (as subject matter); the like is true of propositions; somebody ought, in respect of some science, to assail the problem of indicating those ideas that are used by the science without being a part of its content. In the chapter dealing with "the logical significance of definitions" Professor Young might well have said, what he doubtless knows, that, for example, the notion of definition is no part of the subject matter of logic or mathematics, though for the sake of convenience the notion is continually there in use. The conception of mathematics presented in italics on page 221 leaves the science without any unity except such as belongs to a mere collection, which can never satisfy. The defect is partly cured on page 225. In a democracy it is a duty of scholars to render scientific concepts intelligible to the public intelligence, and Professor Young's book is a valuable contribution to such high service.

The descriptive geometry treated by Professor Wilson and Professor Bartlett is not to be confounded with that great variety of geometry, called descriptive by Russell and others, which was founded by Pasch in his "Vorlesungen über neuere Geometrie" (1882) and a few years later cast in symbolic form by Peano, but it is that branch of geometry which has for its object the representation of 3-dimensional figures by means of their projections upon two or more planes, a method invented by Gaspard Monge (a peddler's son) in response to military exigencies in France and set forth by him in 1800 in his "Géométrie descriptive." Professor Wilson's aim, "to present a sound theoretical treatment" and not to win the student by means of mere appeal to "short cuts" and his "practical" interest, is laudable. As to the extent to which the end has been attained, some mathematicians may be disappointed in not finding here a system of postulates. On the same page (2) we are told that parallel lines are said to have two points in common at infinity, that parallel planes meet each other in a common line at infinity, and that descriptive geometry and perspective are a part of projective geometry. The traditional use of "line" for curve is adopted. Two consecutive points are regarded as points "infinitely close" together but not coincident (p. 81) and as coincident points (p. 93). The statement that "the secant approaches tangency and become such when the two points [of secancy] become coincident" will serve (even after typographical correction) to exemplify a not infrequent occurrence in the book of unprecise statement. One can not but feel that so good a book ought to be better. Typographically and mechanically it is pleasing; there is appended a goodly list of exercises; and the point of view is somewhat more general than is common in American text-books in this subject.

When will some breath of modern mathematics get into our text-books of descriptive geometry? Church's "Elements," published in 1864, has reigned, partly because of its merits, for nearly five decades. To meet the new demands in respect of matter and of presentation, Professor Bartlett has not deemed it necessary to depart essentially from the venerable text of Church. Consequently this interesting and instructive new volume has the scientific odor of a geometric past, despite the excellence of the drawings and pictorial representations of certain more

difficult problems. On page 63 we are invited to think of a moving point as going from one position to the "next." Two points thus next to each other *form* an infinitely small straight line. The two points are consecutive, without distance between them, and "may practically be considered as one point." No talk about limit: a curve is, for thought, composed of infinitely short straight lines. The term locus does not appear except incidentally as on page 84. But "if a point moves so as continually [not continuously] to change its direction from point to point, the line generated is a curved line, or curve." According to the highest mathematical standards, descriptive geometry has not attained, in America, to the rank of a science. It is a tool. Judged as a work designed to teach the use of an important tool, Professor Bartlett's book will render good service. But such books ought to get up-to-date in respect to logic, geometric spirit, conception and nomenclature.

Columbia University C. J. Keyser

Les Poissons Wealdiens de Bernissart. By Ramsey H. Traquair, M.D., LL.D., F.R.S. Extrait des Mémoires du Musée Royal d'Histoire Naturelle de Belgique, T. VI. Bruxelles. 1911. 4to. Pp. iv + 65; 12 pls. and 21 text figures.

In this memoir Dr. Traquair—the dean of paleichthyologists—discusses the fishes of the Wealden, or basal Cretaceous, of Belgium. This formation, though known chiefly for fine skeletons of the dinosaur *Iguanodon,* contains also a highly interesting fish-fauna. This is remarkable for the fact that its species, though relatively few (sixteen), represent both the more archaic members of the group of ganoids as well as the quite modern teleosts. In discussing this fauna, therefore, Dr. Traquair has opportunity of reviewing at once such forms as *Coccolepis,* the last survivor of the Palæoniscidæ, as well as *Leptolepis,* the earliest of the clupeoids.

The memoir is of necessity devoted mainly to systematic details; none the less broader questions, such as those of morphology, relationship and geological distribution, are not overlooked. And all these themes are treated with the author's characteristic painstaking regard to fact. In short, the memoir is an example of what a systematic review of a fossil fauna should be.

An interesting and very useful feature is the carefully drawn restorations, of which there are thirteen. Especially noteworthy are those of *Coccolepis, Callopterus, Amiopsis, Mesodon* (with new interpretations of the eranial elements) and *Aethalion.* These figures are sure to follow the many others from the same hand, and become part of the stock in trade of all writers on ichthyology.

The fauna of Bernissart, as a whole, is regarded as fresh water. The chief evidence for this view is the entire absence of sharks from this formation, although the group is abundantly represented in other European rocks of equivalent age.

To the friends of Dr. Traquair—and they are many, both in Europe and America—the publication of this memoir has an especial interest. For it shows the doctor, who is past his seventieth anniversary, still working away, with his old-time vigor and enthusiasm, in the field which he has done so much to advance.

Ave Magister! Many be the years
That lie before thee, thronged with busy hours![1]

L. Hussakof
American Museum of Natural History

THE HARRIS TIDAL MACHINE

The Coast and Geodetic Survey has recently put in operation, after a thorough test, a new tide-predicting machine, which performs simultaneously all the operations of the British or Thomson machine and of the first American machine invented by Professor Ferrel. As in the Thomson machine, the tidal curve is drawn from which the height of the tide at any time may be scaled off, but, in addition to this, the times of high and low water are marked upon its axis, and both the time and height of the tide, as well as the height of the water's surface at any given

[1] Dr. S. Weir Mitchell, "The Comfort of the Hills and Other Poems," p. 95. New York, 1910.